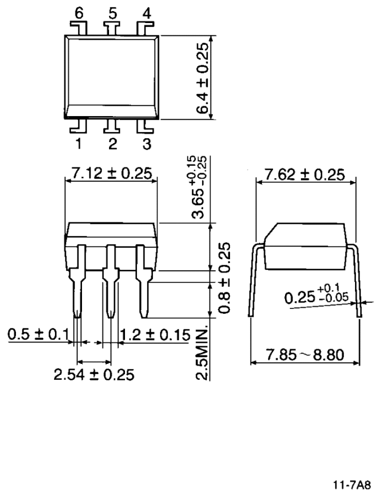
TOSHIBA Photocoupler GaAs IRed & Photo−Transistor

TLP531,TLP532

Programmable Controllers
AC / DC−Input Module
Solid State Relay

Unit in mm



TOSHIBA	11−7A8

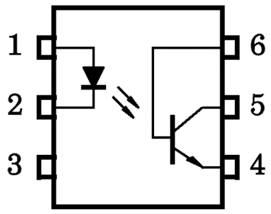
Weight: 0.4g

The TOSHIBA TLP531 and TLP532 consist of a photo−transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP.
TLP532 is no−base internal connection for high−EMI environments.

- Collector−emitter voltage: 55 V (min.)
- Current transfer ratio: 50% (min.)
  Rank GB: 100% (min.)
- Isolation voltage: 2500 V_{rms} (min.)
- UL recognized: UL1577, file no. E67349

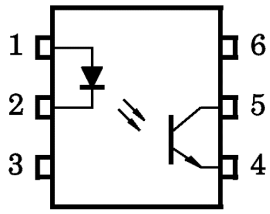
Pin Configurations (top view)

TLP531



1 : ANODE
2 : CATHODE
3 : N.C.
4 : EMITTER
5 : COLLECTOR
6 : BASE

TLP532



1 : ANODE
2 : CATHODE
3 : N.C.
4 : EMITTER
5 : COLLECTOR
6 : N.C.

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	70	mA
	Forward current derating (Ta ≥ 50°C)	ΔI_F / °C	0.93	mA / °C
	Peak forward current (100 μs pulse, 100pps)	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Junction temperature	T_j	125	°C
Detector	Collector−emitter voltage	V_{CEO}	55	V
	Collector−base voltage (TLP531)	V_{CBO}	80	V
	Emitter−collector voltage	V_{ECO}	7	V
	Emitter−base voltage (TLP531)	V_{EBO}	7	V
	Collector current	I_C	50	mA
	Power dissipation	P_C	150	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP_C / °C	−1.5	mW / °C
	Junction temperature	T_j	125	°C
Storage temperature range		T_{stg}	−55~125	°C
Operating temperature range		T_{opr}	−55~100	°C
Lead soldering temperature (10s)		T_{sol}	260	°C
Total package power dissipation		P_T	250	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP_T / °C	−2.5	mW / °C
Isolation voltage (AC, 1min., R.H.≤ 60%)		BV_S	2500	V_{rms}

Recommends Operating Conditions

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	—	5	24	V
Forward current	I_F	—	16	25	mA
Collector current	I_C	—	1	10	mA
Operating temperature	T_{opr}	−25	—	85	°C

Individual Electrical Characteristics (Ta = 25°C)

	Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V_F	I_F = 10mA	1.0	1.15	1.3	V
LED	Reverse current	I_R	V_R = 5V	—	—	10	μA
LED	Capacitance	C_T	V = 0, f = 1MHz	—	30	—	pF
Detector	Collector−emitter breakdown voltage	$V_{(BR)\ CEO}$	I_C = 0.5mA	55	—	—	V
Detector	Emitter−collector breakdown voltage	$V_{(BR)\ ECO}$	I_E = 0.1mA	7	—	—	V
Detector	Collector−base breakdown voltage (TLP531)	$V_{(BR)\ CBO}$	I_C = 0.1mA	80	—	—	V
Detector	Emitter−base breakdown voltage (TLP531)	$V_{(BR)\ EBO}$	I_E = 0.1mA	7	—	—	V
Detector	Collector dark current	I_{CEO}	V_{CE} = 24V	—	10	100	nA
			V_{CE} = 24V, Ta = 85°C	—	2	50	μA
Detector	Capacitance (collector to emitter)	C_{CE}	V = 0, f = 1MHz	—	10	—	pF

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	I_C / I_F	I_F = 5mA, V_{CE} = 5V	50	200	600	%
		Rank Y	50	—	150	
		Rank YG	50	—	300	
		Rank GR	100	—	300	
		Rank GB	100	—	600	
		Rank BL	200	—	600	
Collector−emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 2.4mA, I_F = 8mA	—	—	0.4	V

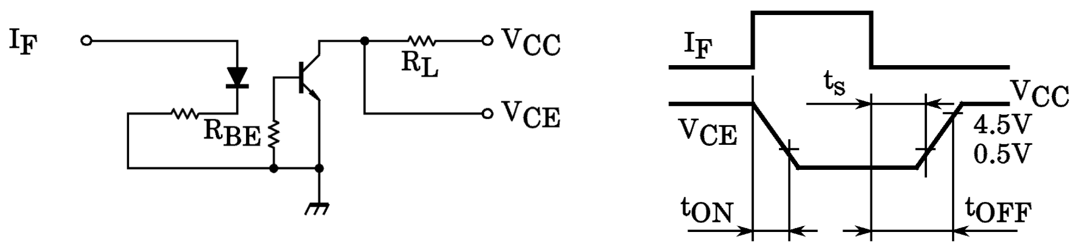
Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C_S	V_S = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500V, R.H.≤ 60%	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	2500	—	—	V_{rms}

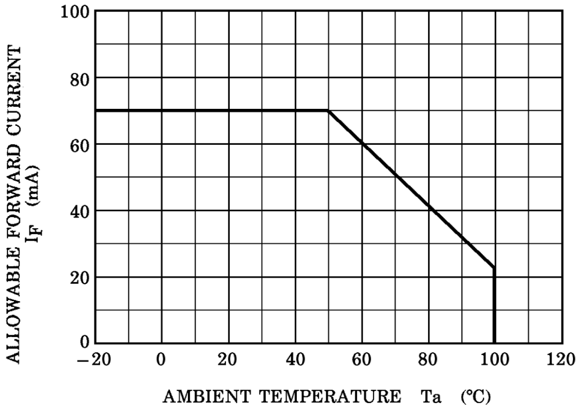
Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t_r	V_{CC} = 10V I_C = 2mA R_L = 100Ω	—	2	—	μs
Fall time	t_f		—	3	—	
Turn−on time	t_{ON}		—	3	—	
Turn−off time	t_{OFF}		—	3	—	
Turn−on time	t_{ON}	R_L = 1.9kΩ (Fig.1) R_{BE} = open V_{CC} = 5V, I_F = 16mA	—	2	—	μs
Storage time	t_s		—	15	—	
Turn−off time	t_{OFF}		—	25	—	
Turn−on time	t_{ON}	R_L = 1.9Ω (Fig.1) R_{BE} = 220kΩ (TLP531) V_{CC} = 5V, I_F = 16mA	—	2	—	μs
Storage time	t_s		—	12	—	
Turn−off time	t_{OFF}		—	20	—	

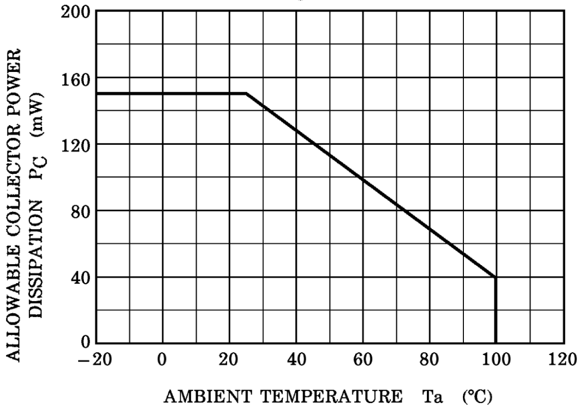
Fig. 1 Switching time test circui



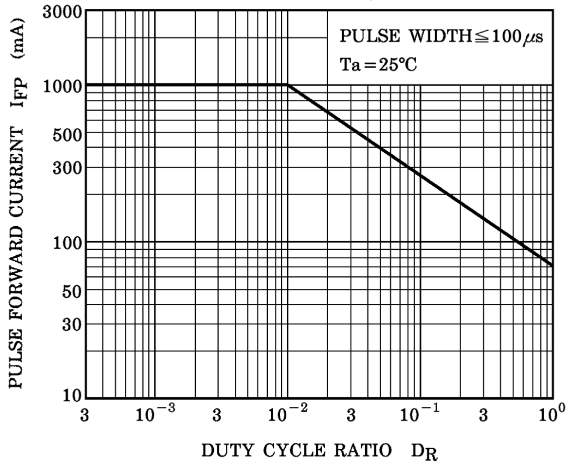
I_F – Ta



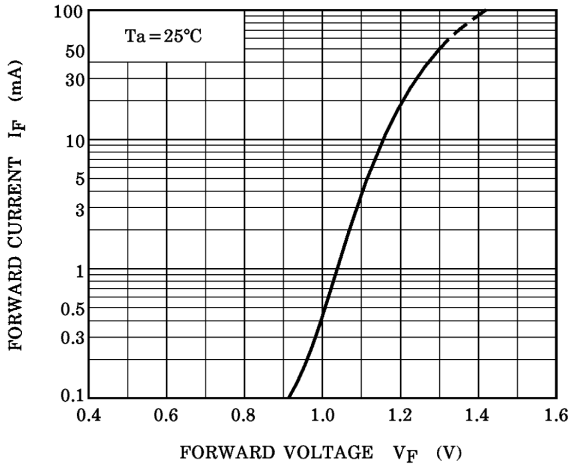
P_C – Ta



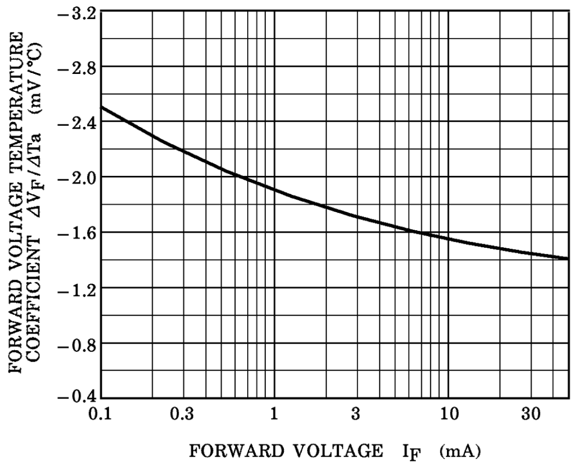
I_{FP} – D_R



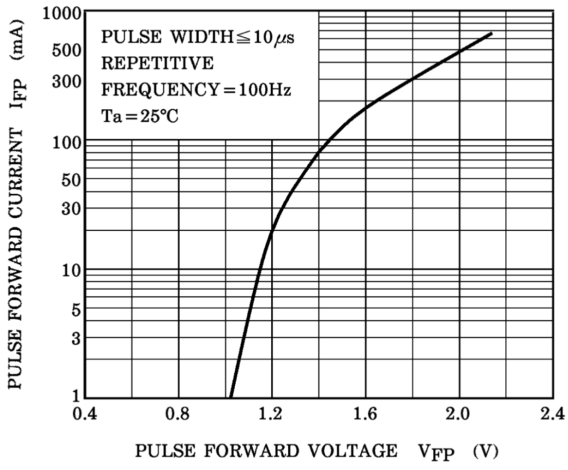
I_F – V_F



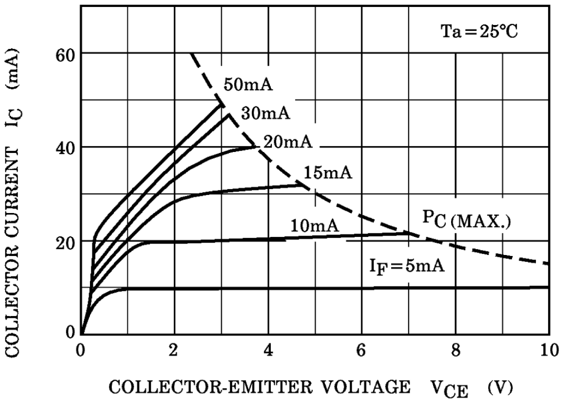
$\Delta V_F / \Delta Ta$ – I_F



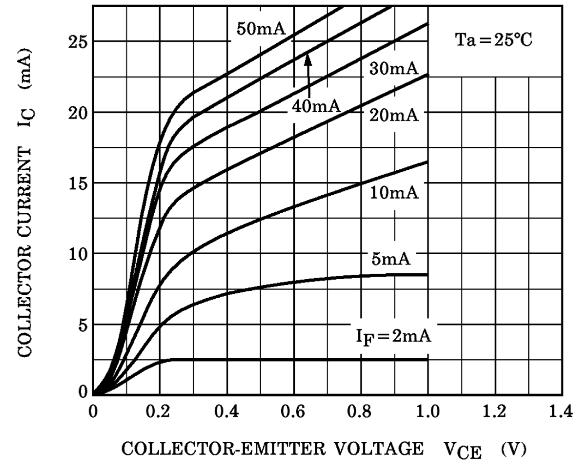
I_{FP} – V_{FP}



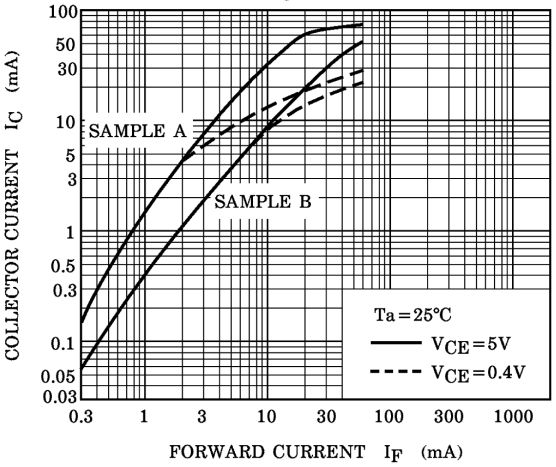
I_C – V_{CE}



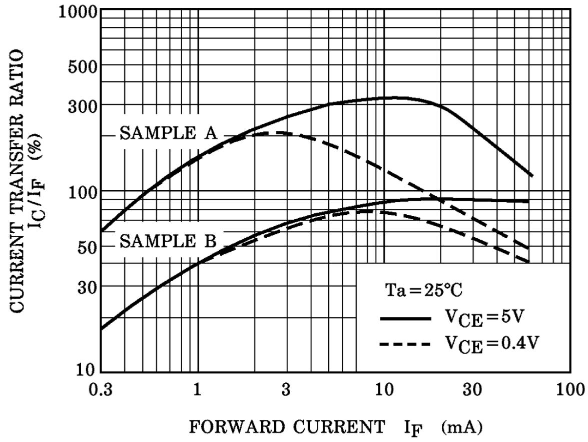
I_C – V_{CE}



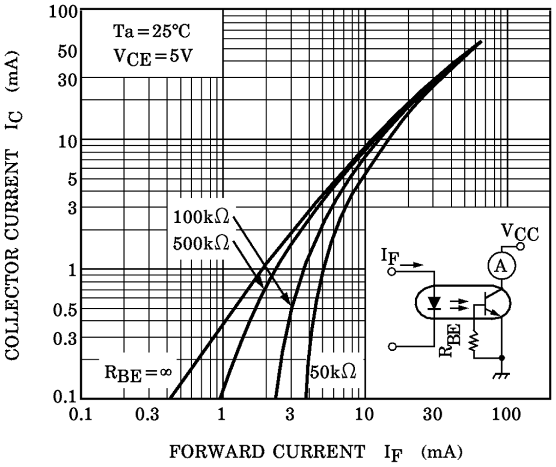
I_C – I_F



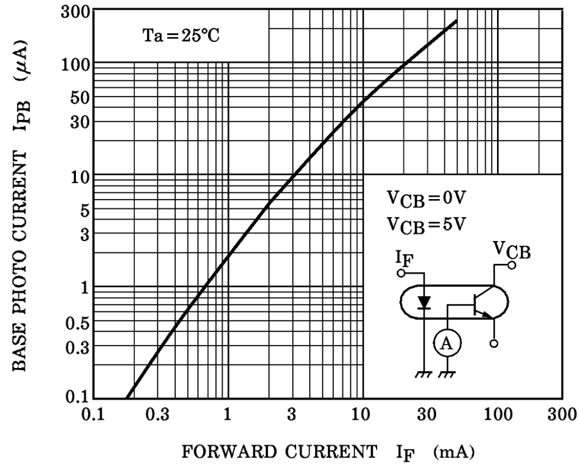
I_C / I_F – I_F



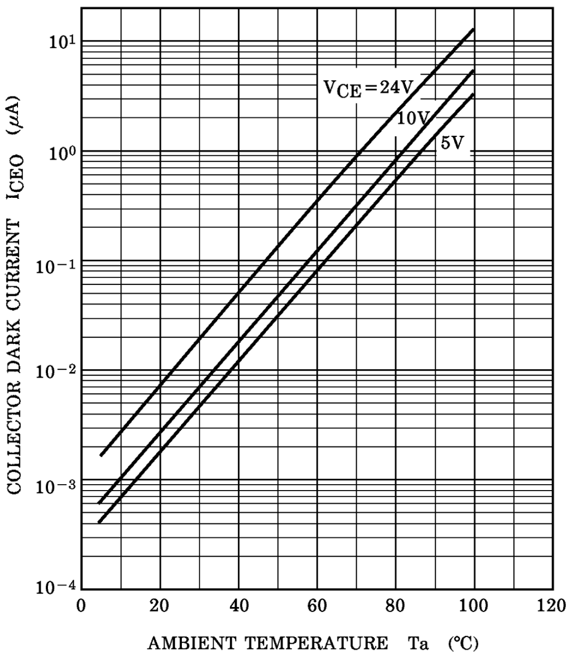
TLP531 I_C – I_F at R_{BE}



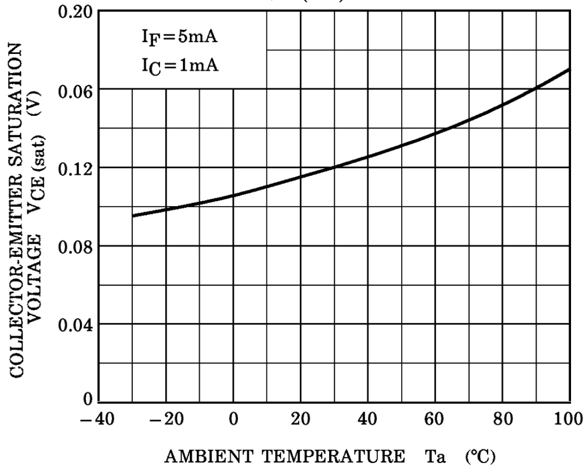
TLP531 I_{PB} – I_F



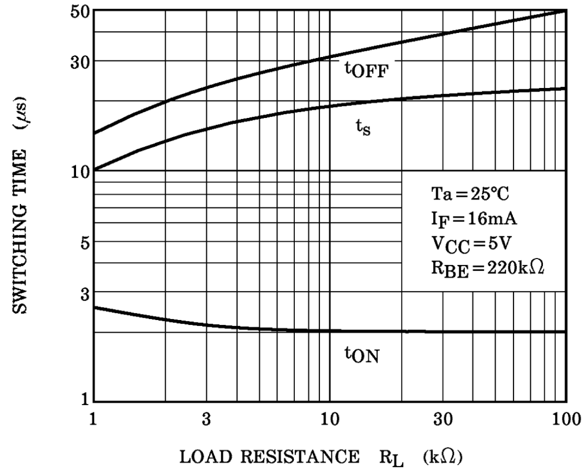
I_D – Ta



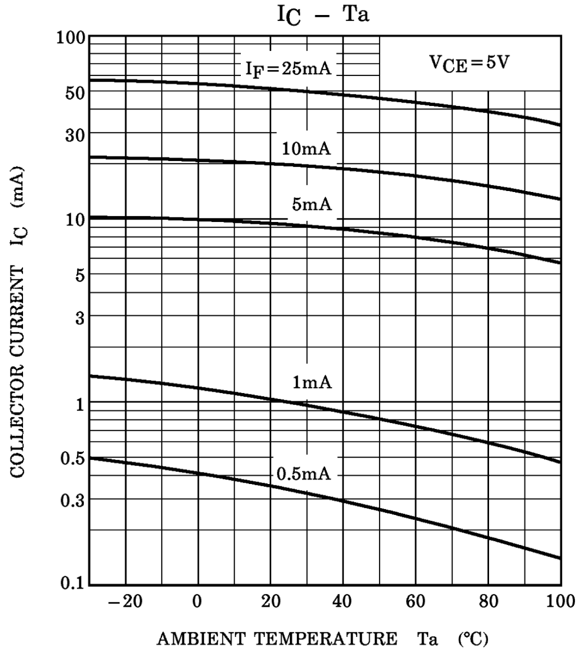
$V_{CE\,(sat)}$ – Ta



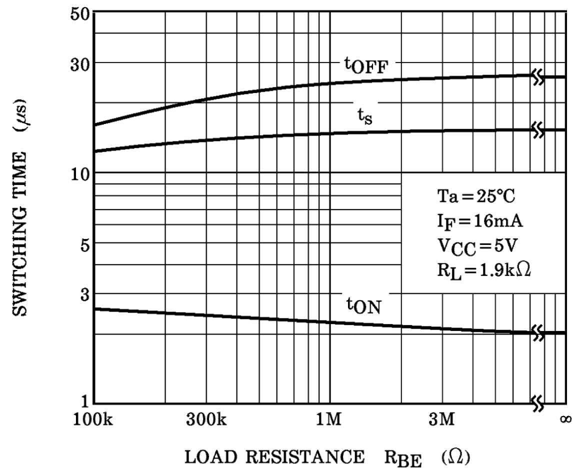
TLP531 SWITCHING TIME – R_L

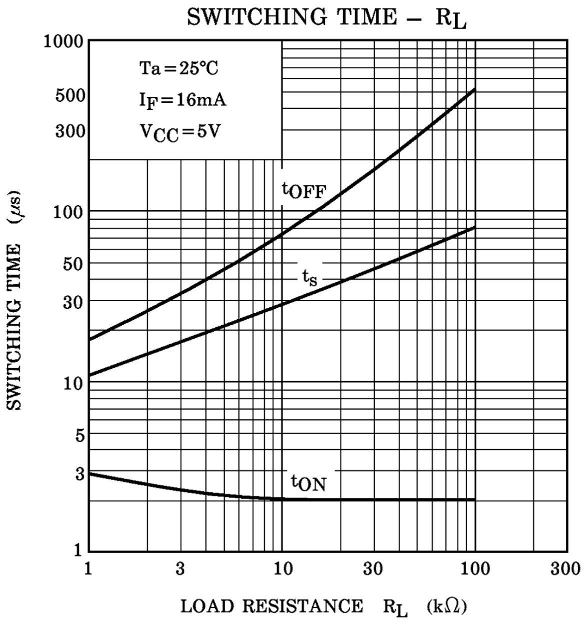


I_C – Ta



TLP531 SWITCHING TIME – R_{BE}




SWITCHING TIME – R_L
Ta = 25°C
I_F = 16mA
V_CC = 5V
t_OFF
t_s
t_ON
SWITCHING TIME (μs)
1000
500
300
100
50
30
10
5
3
1
1
3
10
30
100
300
LOAD RESISTANCE R_L (kΩ)

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000707EAA

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